COMPARISON OF CULTIVATED LAND AND UNCULTIVATED LAND THROUGH DETERMINATION OF pH OF SOIL, ROCK AND WATER IN A SELECTED AREA OF CHAMPHAI ZAWL

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***Abstract*: The purpose of this research is to examine pH of different sets of samples, each set comprises water, soil and rocks, each of which were collected from different places of a particular study area within the plane area of Champhai district, Mizoram state, India. We performed a comparative study on pH of soil, water and rocks from cultivated and uncultivated areas. Here, pH of rain water was taken as the reference irrespective of the extent to which it was polluted. The investigation was performed in the month of february, the rain water in this time gave a moderate pH value and the average value of which was 6.85. This implies the normal air environment being unaffected by major air pollutants. pH value of spring water, soil and rock taken from uncultivated places are less than seven with an average values 5.816, 6.26 and 6.15 respectively. These values indicate that they are more acidic than rain water, the reason seemed to be the effect of chemicals contained in them. pH of water and soil from agricultural area shows a marked increase with an average values of 7.07 and 6.58 respectively. The basic nature of water and soil in this area is attributed to the influences of agro-chemicals. In this manner pH was observed in different sets of samples.**

Index Terms: Spring water, rain water, analysis, pH, cultivated land land, non-cultivated area, acidity and alkalinity, temperature, investigation, study, analysis.

I. INTRODUCTION

pH is an important factor that determines the quality of soil, water and to some extent the quality of rock. The alkalinity and acidity determine the nature of soil and water, that affect sustainability of a particular medium for plants and animals. So that it is the primary step to investigate the nature of soil, water and rock so as to predict the kind of plants and animals appropriated to live in that particular area. Variation in pH of water in different places can be affected by pollutants in air and land environment. On the other hand, the nature of soil and rock without being disturbed by any pollutant may also influence the alkalinity and acidity of water in that area, so that study of soil and rock can give necessary informations for essessment of water quality.

In agricultural land farmers are using fertilizer and pesticides in growing seasons. These chemicals are sometimes overflowing the agricultural land and are discharged to nearby water body. Which is again spreading in a vast area of water body in the water system. This is also another factor that influences water quality in agricultural areas. Although water, soil and rock have their own properties, they are inter-connected to some way in their chemical properties.

II. RESEARCH METHODOLOGY

1. Collection of samples: A particular area of cultivated and uncultivated lands in Champhai district was chosen as the study area. Water, soil and rock samples were collected from different places within the specified area. This process involved the following steps

1.1. Rain water at different places within a specified area were collected.

1.2. Different spring water samples were collected from uncultivated areas.

1.3. Soil samples of uncultivated areas were collected.

1.4. Rock of different types were collected within the specified area.

1.5. Water samples were gathered from different areas in cultivated land.

1.6. Soil samples were collected from different places of cultivated areas within the study area.

2. Experimental procedure

The first step of experiment involved measurement of pH of rain water samples. This experiment was done in the middle of february. pH of different samples was measured and their average value was determined.

For the second step, pH of water samples from the six chosen spring water sources was measured by using calibrated digital pH meter. After that, pH of Soil samples collected from the nearby place of each spring water was measured by using the same calibrated pH meter. Rock of different types collected from the specified area were grinded to powder. Each powder of rock were mixed with equal quantity of deionised water and pH was determined. The recorded pH for each sample shows pH value less than seven and their average value was measured.

For the third set of experiment, pH of water and soil samples collected from cultivated area was measured by using the same pH meter, the experiments was performed in a similar way as done in the first and the second steps. Average pH value of water and soil taken from cultivated area shows pH value higher than those of the uncultivated area. This shows that the alkalinity of soil and water from cultivated land is higher than those of uncultivated land.

III. RESULT AND DISCUSSION

pH of soil, water and rocks from different places within a specified area was studied. The results of these studies revealed the inter-relationship within the frame of water cycle. The value of pH in a particular field is influenced by other field and vice versa. A number of different measurements taken are tabulated as under.

Table-1: pH of rain water from different places of the study area(RN)

S/NO	RAIN WATER (RN)	Ph
1	RN-1	6.8
2	RN-2	6.9
3	RN-3	6.7
4	RN-4	6.8
5	RN-5	7
6	RN-6	6.9

From the experiment performed from rain water, we can guess that the study area is not enormously affected by pollutants like sulphur dioxide, nitrogen dioxide and other acid forming air pollutants, because the pH value of rain water lies in the range 6.7 to 7. The air pollutants expected are smoke and dust particles. The average pH value of rain water (RN) is 6.85

From table-1, pH of most water are less than seven e.i. they are mostly acidic, but the extent of acidity is not large. The reason for mild acidity seems to be the effect of carbon carbon dioxide, carbon monoxide, dust particles etc. floating in the air that dissolve in water vapour resulting pH lower than 7. From the values of pH it can be stated that at the moment the air is not polluted by acid rain causing pollutants like NO_2, SO_2 etc.

Table-2: pH of different samples of soil from uncultivated lands(S-Ul)

S/NO	NAME OF SAMPLE SOURCES	pH
1	ZOKAI (ZK)	6.9
2	THENTUI (TT)	6.1
3	HRIANGAW(HR)	5.7
4	TUI PUMP(TP)	5.9
5	LUANGDARH(LD)	6.5
6	SELUTAR(ST)	6.5

The average pH of soil samples taken from uncultivated area were lower than that of rain water, this shows that they are more acidic than rain water, this implies that their pH get decreased by the chemical compounds present in them that are forming acid solution when they are in contact with water and they are not supposed to get acidified by rain water. The average pH of soil from uncultivated land (S-Ul) is *6.26*

Table-3: pH of different samples of rocks taken from different places of the study area(ST)

S/NO	NAME OF ROCK SAMPLES	PH
1	ST1	5.9
2	ST2	6
3	ST3	6.6
4	ST4	5.8
5	ST5	5.9
6	ST6	6.4
7	ST7	6.5
8	ST8	5.8
9	ST9	5.9
10	ST10	6.6
11	ST11	5.9
12	ST12	6.5

The pH measured from different samples of stone dust/rock powder shows that they are more acidic than rain water, this indicates that they are not affected by rain water in lowering their pH. The reasons seem to lie on the chemical contents which are responsible for lowering their pH when they are in contact with water. Average pH value of rocks (ST) from uncultivated lands is 6.15

Table-4: pH of different samples of water from uncultivated lands(W-Ul)

S/NO	NAME OF THE SAMPLE SOURCES	pH
1	ZOKAI TUI(ZK)	5.5
2	THEN TUI(TT)	5.6
3	HRIANGAW TUI(HR)	5.7
4	TUI PUMP TUI (TP)	6.4
5	LUANGDARH TUI (LD)	5.6
6	VERHTE (VT)	6.1

The pH of water measured from different parts of uncultivated field shows values lower than those of soil and rock. This shows that they are more acidic than those of soil and rock from uncultivated area itself. The reasons seem to be the chemical compounds that are contained in soil and rocks that form acidic solution when dissolved with water. Average pH value of water from uncultivated land (W-Ul) is 5.816

Table-5: pH of different samples of soil from cultivated lands(S-Cl)

S/NO	NAME OF THE SAMPLE SOURCES	pH
1	S-1	6.82
2	S-2	7
3	S-3	6.13
4	S-4	6.37
5	S-5	7.28
6	S-6	5.9

pH of soil taken from cultivated areas shows that they are more alkaline that those of uncultivated soil. In cultivated area people apply agrochemical like fertilizer, pesticides, organic manures, lime and wood ash throughout the year this are the main factors that lower down pH of soil. Average value of soil pH from cultivated land (S-Cl) is 6.58

Table-6: pH of different samples of water from cultivated lands(W-Cl)

S/NO	NAME OF THE SAMPLE SOURCES	pH
1	W-1	7.19
2	W-2	7.30
3	W-3	7.35
4	W-4	6.81
5	W-5	6.90
6	W-6	7.5

The average pH value of water from cultivated area is higher than seven. This indicates that there are some factors that influence their pH value. The reasons seem to lie upon the application of agro-chemicals that are applied to agricultural land. During rainy seasons water overflows these agricultural land, agrochemicals that are impregnated with soil dissolve into that water and making its pH higher than seven and cause it alkaline. Average pH of water from cultivated land (W-Cl) is 7.07

Table-7 : Average pH of soil, water and rock powder from uncultivated lands and average pH of soil and water from cultivated lands.

S/NO	TESTED SAMPLES	AVERAGE pH
1	RN	6.85
2	S-Ul	6.25
3	S-Cl	6.58
4	W-Ul	5.816
5	W-Cl	7.07
6	ST	6.15

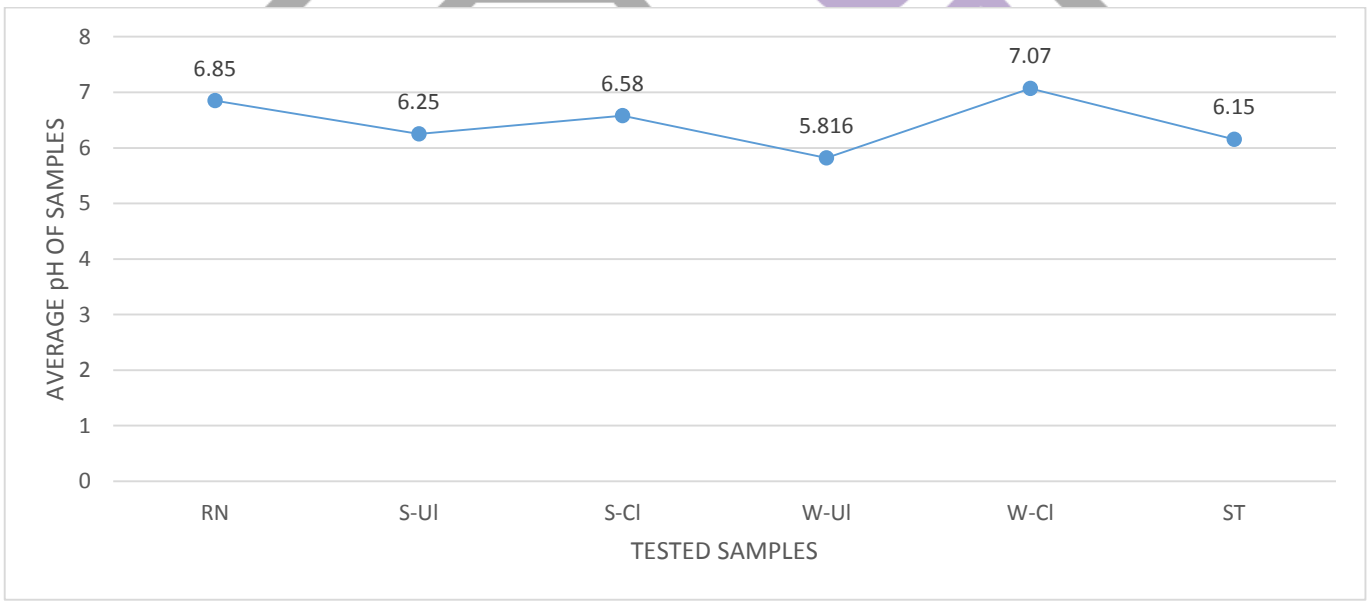

Fig-1: Graph showing variation of average pH in tested samples

The order of pH values from cultivated and uncultivated area is as given below;

W-Ul (5.816) < ST (6.15) < S-Ul (6.25) < S-Cl (6.58) < RN (6.85) < W-Cl (7.07). As mention in the graph, water from uncultivated land is the most acidic followed by stone dust from uncultivated land. The reason seems to lie upon the effect of acidic substance contained in stones and soil that are dissolved in water to form acidic solution. Stone dust/Rock powder has lower pH than that of soil from uncultivated land the reasons appear to be difference in chemical contents of soil and stone dust.The more acidity of soil from uncultivated land than that of cutivated land is mainly caused by application of agro-chemicals in cultivated land throughout the year. These chemicals bring about the more alkalinity of soil in cultivated lands. Rain water is not much affected by air pollutants, because the area of study is free from industries and crowded vehicles that are producing chemicals that are causing acid rain. The mild acidity is caused only by dissolved carbon dioxide, carbon monoxide, dust and minute quantities of other pollutants.

The most alkalinity of water from cultivated area is in fact caused by agro-chemicals that are draining to water body during rainy seasons or natural water flowing from cultivated lands into the water body whole through the year.

IV. CONCLUSION

Water in its natural state is neutral, but its pH may be altered by the decrease and increase of temperature as well as chemicals dissolve in them. The studies in the specified area reveal that water and soil in uncultivated area are more acidic than that of cultivated area, the main reasons seems to lie upon the application of agro-chemical throughout the year in cultivated land. The more acidic nature of stone, water and soil in the uncultivated area appears to be uneffected by rain water. Because rain water is less acidic than those of water and soil from uncultivated lands. The reasons of most acidity of water from cultivated lands seems to lie upon the effect of chemicals in soil and rock which dissolve in the water bodies. The least acidity of water from cultivated area is considered to be the effect of agro-chemicals from the applied area in the cultivated land.

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